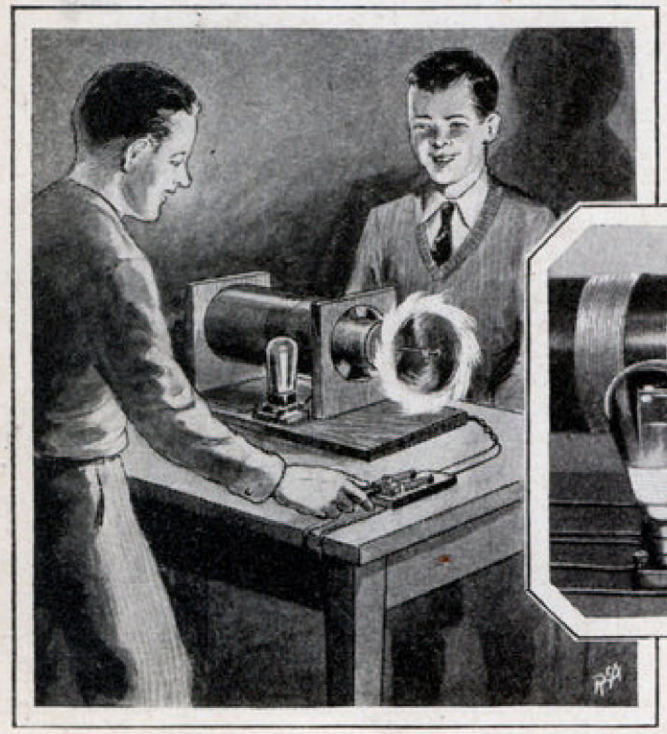
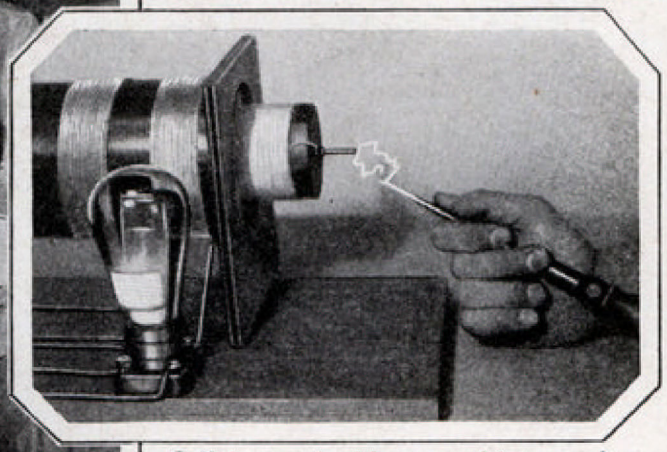
Vacuum Tube Tesla Coil

Light bulbs and spinning wires which glow with weird effects, cigarettes which light mysteriously—these are a few of the stunts you can do with this vacuum tube Tesla coil.





Coil is tested with screw driver as shown.

One of the spectacular effects that can be created with Tesla coil is shown above. Spinning wire shoots off glowing sparks when current is turned on.

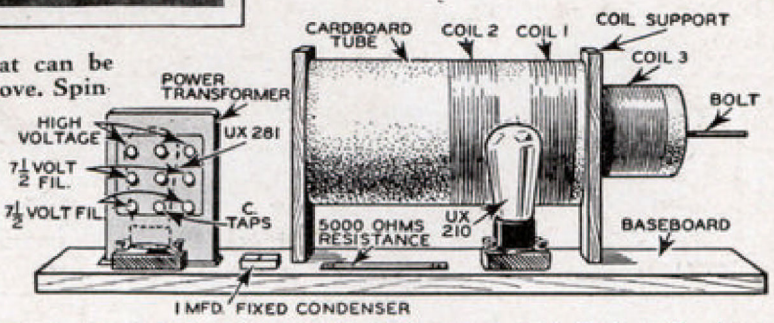


Fig. 1. Here is a side view of the vacuum tube Tesla coil, showing the layout of parts on a baseboard. For higher power, an additional tube may be used, wired up in parallel with the 210 tube.

THE older types of Tesla coils, calling for a high tension transformer and spark gap for excitation, were undoubtedly interesting and instructive, but the one shown in the accompanying photographs and sketches will prove much less expensive to construct and yet will provide plenty of sure fire fun and spectacular results. It makes use of many radio parts and therefore should prove very inexpensive to construct by those readers possessing a stock of spare radio "junk." It is simply a matter of plugging in to the 110-volt electric light line to carry on an almost endless number of interesting and instructive experiments in high frequency currents. You will need the following parts:

A baseboard 18 in. long by 10 in. wide.
Cardboard tube 8 in. long, 4 in. diameter.
Cardboard tube 11 in. long, 2½ in. diameter.
Two radio UX sockets.
Transformer giving about 500 volts and provided with two 7½-volt filament windings.
One 210 type radio tube.
One 281 type rectifying tube.
Two wooden supports for the 4 in. tube.
One 5,000-ohm grid leak about 5 watts rating.
One 1 Mfd. fixed condenser to stand at least 500 volts breakdown voltage.
50 ft. No. 16 DCC wire.
700 ft. No. 28 DCC wire.
Hookup wire.
Assortment of nuts, bolts, screws, etc.

The hookup and layout of parts indicated in Fig. 2 should be followed to the letter to insure best results. Place the transformer at the left end of the baseboard near the rear. Then mount one of the sockets in front of it for the rectifying tube (281). To the right of the tube mount the fixed condenser. Mount the two coil supports to the right of the transformer. Then in front of this coil mount

Does Fascinating Stunts

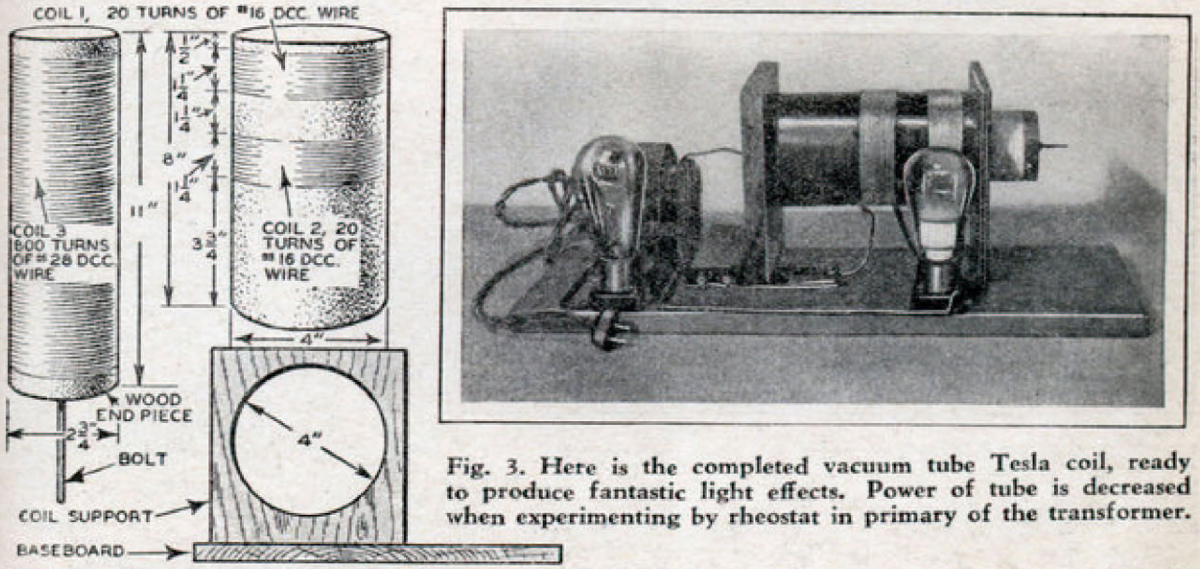


Fig. 3. Here is the completed vacuum tube Tesla coil, ready to produce fantastic light effects. Power of tube is decreased when experimenting by rheostat in primary of the transformer.

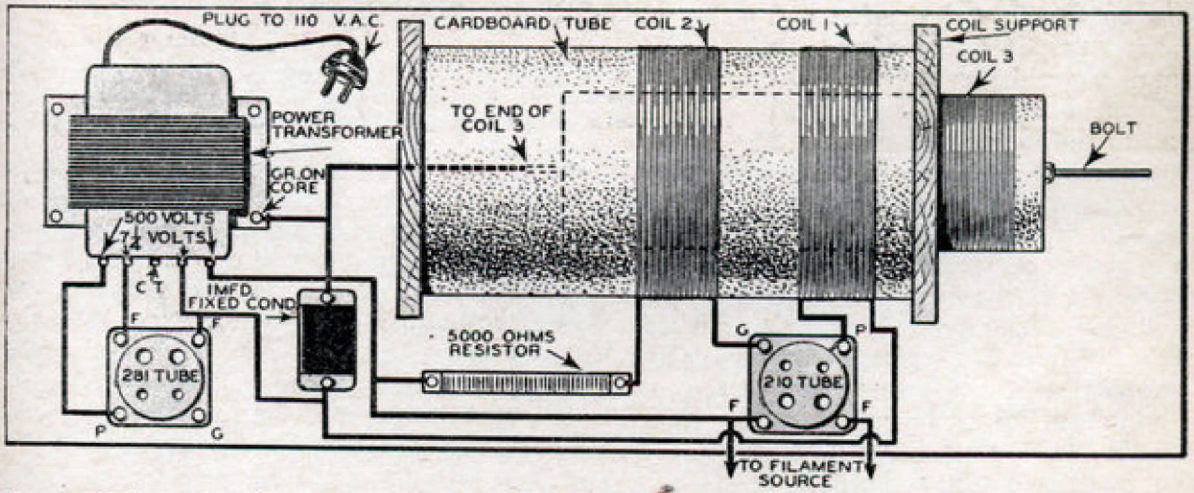


Fig. 2. Coils 1, 2 and 3 are wound on cardboard tubes to dimensions given in top drawings. Lower drawing gives layout of parts on baseboard and hook-up for tubes and coils. Coil 3 is inserted in coils 1 and 2 as shown. Filament leads of 210 tube are wired to 7½ volt terminals of transformer.

the remaining socket for the 210 oscillating tube.

Now comes the winding of the coils. First wind those called Coil 1 and Coil 2 on the 4-inch tube. These consist of 20 turns each of No. 16 DCC wire. Note the dimensions and spacings on the diagram (Fig. 2). Wind closely and tight and space them 1¼ inches apart. Wind in the same direction and secure the ends by any manner at hand. Wind in the same direction as the two former coils and secure each end to a bolt, the right hand one projecting out two or three inches from the end.

Mount the 4-inch coil in the supports as shown. Now slip the 800-turn coil (Coil 3) inside the larger tube and by means of blocking or little angle pieces, support it in the center of the large tube equidistant from all sides as illustrated in Fig 4. Solder all connections not secured by connectors or binding posts and make all leads as short as possible. Hookup wire can be either bare copper wire covered with spaghetti, or any type so long as it is well insulated and about No. 18 gauge.

Start with Coil 1. Connect the outside lead to one side of the fixed condenser and to one side of the filament winding used to light the rectifying (281) tube. The inside lead of Coil 1 then connects directly to the plate terminal on the 210 tube socket. Now connect the inside lead of Coil 2 to the grid binding

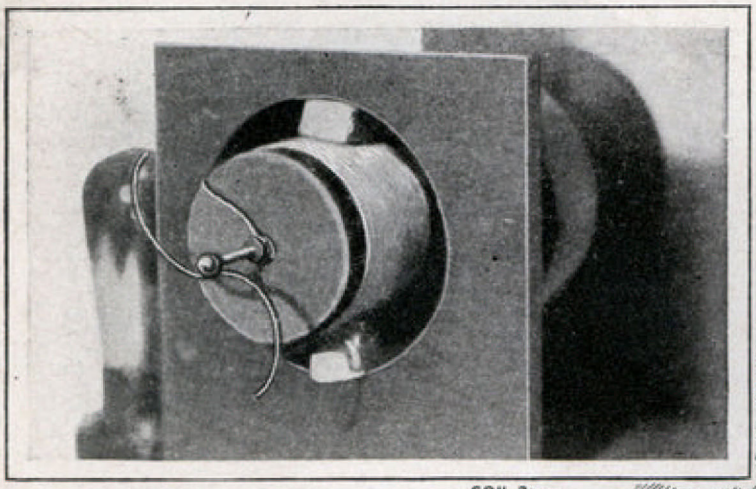


Fig. 4. Cardboard form for coil 3 is held firmly in place by means of blocks as shown here. Photo also shows spinning "S" wire.

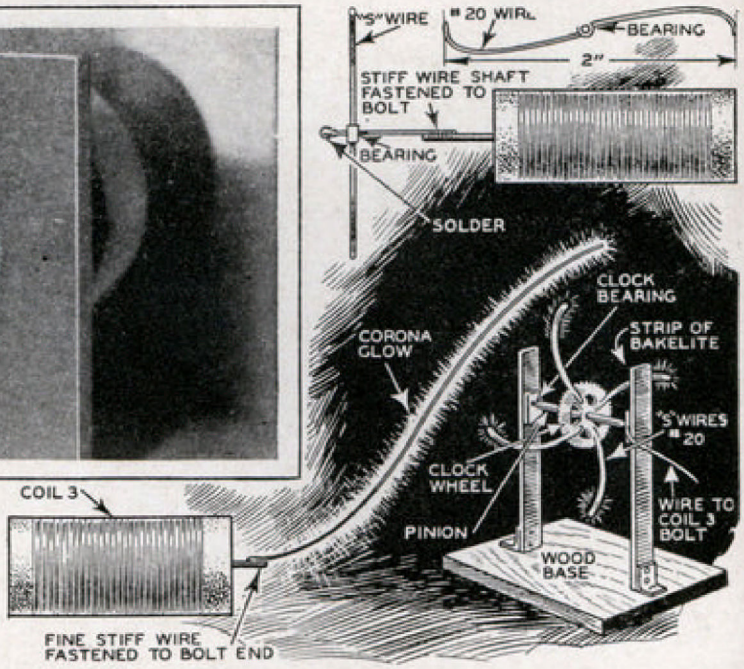


Fig. 5. Spinning "S" wire and straight wire for experiment on corona discharge is fastened to bolt as shown. At right is rotor made from clock parts which produces fascinating corona glow.

post on the 210 tube socket and connect the outside lead to one end of the grid leak resistor. Connect the other side of the grid leak to the inside end of Coil 3 (next to the transformer), to the iron core of transformer to filament post of 210 tube, to one side of the high voltage winding on the transformer and remaining side of fixed condenser. The remaining side of the high power winding is then connected direct to the plate of the 281 tube. Each filament winding is then connected to the filament terminals of the two tube sockets. This completes the wiring. The transformer primary should of course be provided with a cord and plug.

To test first plug in the transformer. This will light the tube filaments. Then, to see if the high voltage is energizing the Tesla coil, run a screwdriver or other metal tool up and along the bolt at the protruding end of Coil 3, as demonstrated in the photo on page 92. It should draw sparks as it passes over the threads and will prove it is working. If no show of energy occurs go over the wiring thoroughly (first pulling the plug) and look for disconnected wires or poorly soldered joints. When properly hooked up it will surely work and you are then ready for a number of highly fascinating experiments.

With your Tesla coil operating properly you are ready for some of the most weird and interesting experiments imaginable. First, do not fear a shock. Slight burns may result if taken on the bare flesh but if one holds a metallic object in the hands no sensation is noticeable. Therefore, there is no danger.

First let's see what can be done about drawing a spark from the bolt on Coil 3. Hold a metal tool in the hand and gradually bring it near the bolt. When the breakdown distance is reached sparks will jump between the two metals similar to lightning. Too great a voltage must not be used, but any voltage from 350 up to about 750 volts is perfectly safe.

Now let's try a little experiment with an electric light bulb. If you can get hold of a bum one so much the better. First fasten a small metal ball to the end of the bolt. Then, holding a 15 or 20-watt bulb by the glass, bring the metal ferrule near the bolt. As it approaches it will commence to glow and change colors according to the gas in the bulb and the power of the coil. Get a bulb in the "Five and Ten" marked "made in Japan" if you want to see some fascinating effects.

Here is another fascinating demonstration. Fasten a very fine, stiff wire to the bolt and bend it up and outward in a wide curve as illustrated in Fig. 5. Plug in the coil and watch the result in a darkened room. Varying the output voltage will change the glow around the wire and at the very end will be seen a very concentrated discharge of fire.

(Continued on page 140)

Profits From Air Rifle Gallery

(Continued from page 44)

means of a piece of sheet iron or strap iron bent to shape. From this depends a piece of bar brass which acts as the bell. A small hinge is riveted to the top end of the strap iron support, thus permitting the target to swing back and forth.

The stationary target (Target "B") is the same diameter as the swinging affair, save that its bulls-eye is ½ inch in diameter and it is attached to the back of the frame by means of two bolts which run through 2 by 2 inch pieces 3 inches long. From one hangs a bell taken from an old alarm clock.

Midway between the swinging and stationary round targets, is a spinner (Target "C"). This is made from a piece of light strap iron drilled ¼ inch one side of center. The ends are formed to a point, put through the centers of 2 by 2 inch squares of heavy sheet metal and riveted. A bolt runs through the center of the arm and through the ends of strap iron supports bolted to the back of the frame. Short pieces of rubber tubing are slipped over the bolt to prevent play of the spinner. One end being slightly heavier than the other, it always remains in an up and down position. Struck with a shot, it will spin around and around.

Directly below this is a regulation aluminum target (Target "D") frame to hold paper targets for individual scoring. This target is furnished by a large air rifle manufacturer for $.50. It enables patrons to read their scores.

Details are beginning to take shape nicely now. There remains the rabbits and the flat belt. To the three ply canvas are fastened the 8 rabbits, evenly spaced, each cut from very heavy galvanized sheet iron, of the shape shown. The hinges are of iron, about 1 inch long. Figs. 4 and 6 show how the rabbits are assembled. The hinges should be riveted to the front edge of the belt so that the rabbits will drop slightly forward when on the top side. A hinge is made so that it will swing through three quarters of a circle. Be sure to set them in place for riveting so that one hinge half will lock against the other half and thus hold the bunny upright when in position.

Finally, the frame including the back board, was painted black, and the targets, aluminum, the paint for the latter being rubbed on with a rag. A shooting distance of about 20 feet, if available, will be ideal. One improved air rifle, recently placed on the market, holds 25 shots. It is pumped up, but an adjustment at the breech can be made so that at least 20 shots can be fired as fast as you can pull the trigger. And, we admit, that is fast shooting.

The commercial angle, mentioned at the beginning of this yarn, has real possibilities, especially in these depressing times. The attractive thing is this. You pay 25 cents for 12 shots at a regulation shooting gallery where 22 caliber guns are used. Put on a profit basis, this air rifle gallery will make more money if you give 20 shots for a dime, or 50 shots for a quarter, than the gallery using .22 guns, when 12 shots for a quarter is charged. The steel pellets cost but a nickel, retail, for a box containing upwards of 175 and the operating cost is negligible.

Here's what one air rifle gallery operator did. He charged 10 cents for 20 shots, or 25 cents for 50. His daily receipts, in connection with his barber shop in the small town, were about $6. And, after 60,500 shots had been shot through the gun, he found that it was shooting as hard and accurately as when he got it. The gun he used cost $5.

Summing up, such a gallery will give the customer 4 times as many shots for a quarter as he can get where 22 caliber guns and ammunition are used—a big inducement. The targets just described offer a variety, coupled with action, which will draw the crowds. Incidentally, the gallery described in this story was loaned to a miniature golf course immediately after completion, and it has been earning good money.

Tesla Coil Does Fascinating Stunts

(Continued from page 94)

Here is one of the most spectacular stunts of all. It is a rotor spinning from the high frequency oscillations and emitting a changing corona discharge ever fascinating and beautiful. Bend a piece of fine wire such as No. 22 or 24 into a wide S as shown in Fig. 5. Slip this over a piece of stiff wire fastened to the end of the bolt horizontally. The wire must rotate freely and be free from kinks or corners. Start the coil and watch the S wire spin. It will rotate at terrific speed well up into several thousands of R.P.M.s. All around the circle will be seen an even number of brush discharges and the peculiar thing is that they will always be an even number.

Here is a way to mystify the crowd. Hold a match head near the bolt. No effect is no-

ticed. Then wet the head so it is soaking. Hold it near the bolt again and it lights! The dry head was non-conductive but the wet head acted as a metallic conductor and soon ignited from the spark produced. Done with the bolt and coil hid behind a thin partition makes the trick doubly mysterious.

As the user becomes accustomed to the action of his Tesla coil he will discover many more interesting and instructive uses for it. Common things can be utilized to produce many weird results and spectators will never tire of watching the effects of its action. As before stated, there is not the least danger in its effects. But, don't get careless with the direct output of the transformer itself. The current produced is at a much lower frequency (6 cycle) and 500 volts or more at this frequency will give quite a kick if taken through the body.

Miniature Submarine

(Continued from page 109)

screw shaft of the propeller should be inserted in the hole at the top and held in place by two lock nuts, as illustrated in Fig. 4. This completed, the next task is to make the crank, crank bearing and front hook. This latter piece is similar in construction to the front holder. Lower inset in Fig. 1 shows manner of construction. This assembly is mounted on the prow end of hull. To prevent the crank from unwinding, bend a portion of the sheet iron bearing sharply over with pliers, to form a catch.

This toy submarine uses a sheet of lead for ballast. The sheet is cut to shape, and bent to the dimensions given in Fig. 1, and is secured in the groove under the hull with two screws. Here you may have to cut off some of the lead to obtain the proper weight, as it is essential that the ballast be just heavy enough to allow a part of the hull to remain above the water.

Now to equip the sub with the diving fins. First bore a hole squarely through the hull 9 in. from the prow and 1½ in. below the top side. Cut a rod long enough to protrude one inch on either side of the hull and large enough to make a rather loose fit in the hole. Slot these ends and fit and solder in them two fins cut from sheet tin. Fig. 2 shows dimensions and method of assembly.

All that remains now is to secure a strong rubber band to the screw shaft and to the crank. A strip from an old inner tube will serve here excellently.

Flying Goose Radiator Cap

(Continued from page 67)

into the workbench.

Use pins or long brads for the axes of head and neck, and be sure the holes are large enough for the parts to move freely. A neat counterbalance weight for the tail is made by rolling a cylindrical piece of lead in an extension of the former, as shown in the drawings. When air currents force the tail to a horizontal position this weight moves up into a recess of the body shown in Fig. 1. Set your goose on a standard of galvanized wire to clip around the radiator cap, and give it a try-out before painting. If the wings flap too high or too low, or both, make the necessary adjustment by using thicker wood stops. You may need to change the tension of the rubber bands for smoother action.

After tests are made, by all means give your goose the very best paint job you know how. Give all wood parts a white groundcoat, and sandpaper smoothly when dry. The bird should, of course, be taken apart for the painting. Next, with a comparatively dry brush—that is, without paint dripping from it—touch in the brown feathers until only the wing tips are left white. Also leave the breast white, as well as the underpart of the body, a portion of the neck and a spot on the side of the head, as shown in Fig. 3. Black, glass-headed pins cut off to about ¼ in. are used for eyes, and they certainly give this lively fowl a determined look.

With a first rate paint job this radiator ornament will cause much comment.

Door Stop Is Automatic

THIS stop holds the garage doors open against wind when backing the car out. The stops are made of ¾-inch white pine, hinged as shown in the drawing, with an old valve spring inserted between the "sandwich." The bottom plate is nailed to an oak stake and the stop driven into the ground so that the door will compress it in swinging open. — Theodore Allen.